

**REMARKS*****Summary of the Response***

By the present response, claims 12, 18 and 19 have been amended, new claims 32 – 35 have been presented, and claim 23 has been canceled without prejudice or disclaimer. More specifically, claims 12 and 22 have been amended to more clearly recite the features of the present invention, claim 18 has been amended into independent form with additional features, and claim 19 has been amended to correct a minor typographical error. Applicant submits that no new matter has been added by the above amendment. Support for the amendment may be found, for example, in Figures 1 and 2 and previously presented claims 18, 19 and 23. Accordingly, claims 12 – 22 and 24 – 35 remain pending, of which claims 27 – 29 have been withdrawn as directed to a separate invention. Reconsideration of the rejected claims in view of the following remarks is respectfully requested.

***Summary of the Office Action***

In the instant Office Action, the Examiner has rejected claims 12 – 22 and 24 – 26 and 29 – 31 over the art of record. By the present remarks, Applicant submits that the rejections have been overcome, and respectfully requests reconsideration of the outstanding Office Action and allowance of the present application.

***Traversal of Objection to Drawings***

The Examiner objected to the figures for purportedly failing to show the at least one rib projects radially from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root, as recited in claim 12. However, Applicant submits that Figure 1

shows the recited feature. That is, claim 12 recites that at least one rib projects from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root. As shown in Figure 1, at least one rib projects from the hub groove root.

Additionally, the Examiner objected to the figures for purportedly failing to show at least two parallel ribs radially extend from one of each hub groove head, each hub groove root, each shaft groove head and each shaft groove root, as recited in claim 19. However, Applicant submits that Figure 5 shows the recited feature. That is, claim 19 recites at least two parallel ribs radially extend from one of each hub groove head, each hub groove root, each shaft groove head and each shaft groove root. As shown in Figure 5, at least two parallel ribs radially extend from each hub groove root.

As such, Applicant respectfully submits that the drawings show the recited features of the invention. Accordingly, Applicant requests the drawing objection be withdrawn and the Examiner indicate that the Figures are in compliance with 37 C.F.R. 1.121(d).

***Traversal of Rejection Under 35 U.S.C. § 112, 2<sup>nd</sup> Paragraph***

The Examiner has rejected claims 12 – 22 and 24 – 31 under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph for being indefinite. Specifically, with regard to claims 12, 13 and 22, the Examiner asserts that it is “unclear what exact elements Applicant is referring to as ‘a groove head’ and a ‘groove root’ of the hub and shaft.” Additionally, the Examiner states, “it is unclear how the rib could also be projected from the grooves of the shaft and at the same time projecting towards the groove of the hub, since from the drawing it appears to be if the rib projects from the grooves of the shaft then the rib is going to be away from the groove of the hub instead of toward the groove of the hub.” Furthermore, the Examiner states “no point of reference has been defined to enable

one to properly ascertain what constitutes the groove hub, etc.” Applicant respectfully disagrees with the Examiner’s assertions.

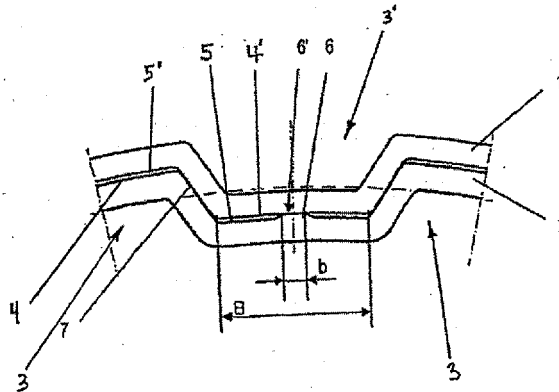
According to MPEP 2173.02, the test for definiteness under 35 U.S.C. 112, second paragraph, is whether “those skilled in the art would understand what is claimed when the claim is read in light of the specification.” *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1576, 1 USPQ2d 1081, 1088 (Fed. Cir. 1986). Moreover, definiteness of claim language must be analyzed, not in a vacuum, but in light of: (A) The content of the particular application disclosure; (B) The teachings of the prior art; and (C) The claim interpretation that would be given by one possessing the ordinary level of skill in the pertinent art at the time the invention was made.

Applicant respectfully submits that the claims are definite and clear. With regard to the Examiner’s first assertion, Applicant respectfully submits that the groove head and the groove roots of the hub and the shaft are clearly explained. Applicant submits that these terms should be interpreted in light of the specification. Moreover, Applicant submits that the specification clearly describes the groove head and the groove roots of the hub and the shaft, for example, at least at paragraph [0028] and Figure 2. In Figure 2, numeral 4’ designates a groove head of hub 1, and numeral 5 designates a groove root of shaft 2. Thus, Applicant submits that the Examiner’s position that “unclear what exact elements Applicant is referring to as ‘a groove head’ and a ‘groove root’ of the hub and shaft,” is not supportable. That is, the standard for indefiniteness is whether those skilled in the art would understand what is claimed when the claim is read in light of the specification.

With regard to the Examiner’s second assertion that “it is unclear how the rib could also be projected from the grooves of the shaft and at the same time projecting towards the groove of

the hub, since from the drawing it appears to be if the rib projects from the grooves of the shaft then the rib is going to be away from the groove of the hub instead of toward the groove of the hub,” Applicant respectfully disagrees. That is referring to Figure 2 (reproduced below), the hub (or outer tube 1) has groove roots 5’ and groove heads 4’. Additionally, the shaft (or inner tube 2) has groove roots 5 and groove heads 4.

**Fig. 2**



With this understanding in mind, Applicant submits it would be clear to one of ordinary skill in the art, upon reading the instant specification, how a rib may project: (1) from the hub (or outer tube 1) groove root 5' inwardly towards the shaft (or inner tube 2); (2) from the hub (or outer tube 1) groove head 4' inwardly towards the shaft (or inner tube 2); (3) from the shaft (or inner tube 2) groove root 5 outwardly towards the hub (or outer tube 1), as is illustrated in Figure 2; or (4) from the shaft (or inner tube 2) groove head 4 outwardly towards the hub (or outer tube 1).

With regard to the Examiner's third assertion that "no point of reference has been defined to enable one to properly ascertain what constitutes the groove hub, etc.," Applicant respectfully disagrees. That is, as discussed above, Applicant submits that the specification does provide a

point of reference for enabling one of ordinary skill in the art to properly ascertain what constitutes "the groove hub, etc."

Thus, for at least these reasons, Applicant respectfully submits that the claims are in compliance with 35 U.S.C. § 112, 2<sup>nd</sup> paragraph. Accordingly, Applicant respectfully requests the Examiner withdraw the rejection of claims 12 – 22 and 24 – 31 under 35 U.S.C. § 112, 2<sup>nd</sup> paragraph, and indicate that claims 12 – 22 and 24 – 31 are in compliance with 35 U.S.C. § 112, 2<sup>nd</sup> paragraph.

***Traversal of Rejection Under 35 U.S.C. § 103(a)***

***1. Claims 12 – 21 and 30 Over POWELL***

Applicant traverse the rejection of claims 12 – 21 and 30 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 3,364,768 issued to Powell [hereinafter POWELL] alone. The rejection is respectfully traversed.

While not agreeing that any of the above-noted claims are unpatentable over the above-cited document, in an effort to advance prosecution, Applicant has amended claim 12 with clarifying features and amended claim 18 into independent form.

**Independent Claim 12**

Claim 12 recites, in pertinent part:

. . . wherein the at least one rib projects radially from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root,

wherein the hub groove roots and the hub groove heads of the plurality of grooves of the hub and the shaft groove roots and the shaft groove heads of the plurality of grooves of the shaft are each substantially flat, and

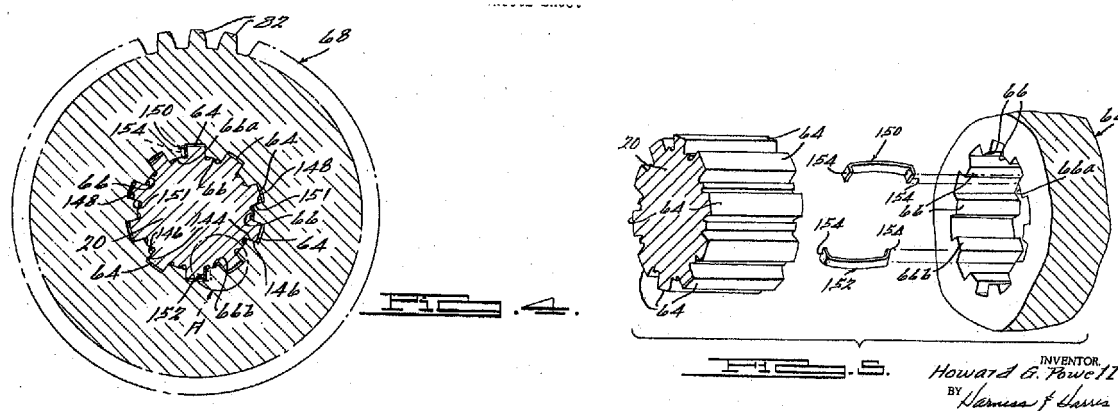
wherein at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined.

Applicant submits POWELL does not teach or suggest each of the features of the present invention. For example, Applicant submits POWELL does not teach or suggest: (1) wherein the hub groove roots and the hub groove heads of the plurality of grooves of the hub and the shaft groove roots and the shaft groove heads of the plurality of grooves of the shaft are each substantially flat; (2) wherein at least one of the hub and of the shaft is a thin-walled hollow profile which is internally and externally splined; and (3) wherein the at least one rib projects radially from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root, as recited in claim 12.

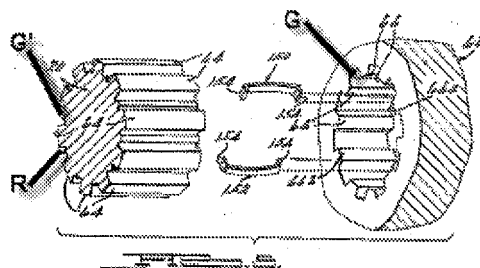
No Teaching Or Suggestion Substantially Flat The Hub Groove Roots, Hub Groove Heads, Shaft Groove Roots And Shaft Groove Heads

Applicant submit that POWELL does not disclose wherein the hub groove roots and the hub groove heads of the plurality of grooves of the hub and the shaft groove roots and the shaft groove heads of the plurality of grooves of the shaft are each substantially flat.

POWELL teaches a multiple speed power transmission mechanism. More specifically, POWELL teaches an anti-rattle spring for a multiple speed power transmission mechanism. In addressing previously presented claim 12, the Examiner asserts that POWELL teaches the features of the invention at Figure 5. Applicant has reproduced Figures 4 and 5 of POWELL below.



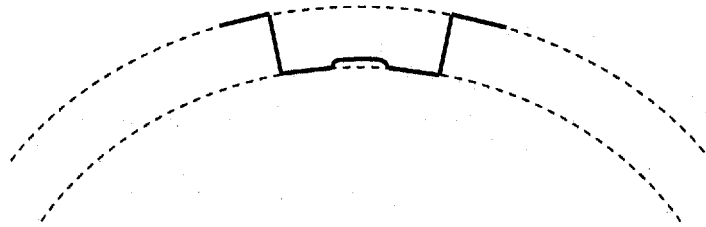
The Examiner designates element 20 as the recited shaft and element 68 as the recited hub. Moreover, the Examiner designates the recited groove and ribs as shown in the reproduced Examiner-notated Figure 5.



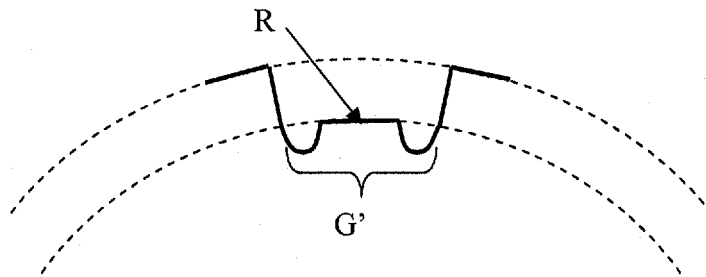
With the above in mind, Applicant submits that POWELL does not teach or suggest wherein the hub groove roots and the hub groove heads of the plurality of grooves of the hub and the shaft groove roots and the shaft groove heads of the plurality of grooves of the shaft are each substantially flat. That is, assuming *arguendo* that the unlabeled portion of POWELL (i.e., Examiner-designated element "R") depicts a "rib" projecting from the groove root, which Applicant does not concede, then a careful review of the entire drawings reveal that each of the groove heads and roots of both the hub and shaft are not substantially flat, as recited in claim 12. In order to illustrate this position, Applicant has provided a depiction of an exemplary

embodiment of the grooves of the present invention along with an enlarged depiction of the structure of POWELL below.

Sketch of detail of claimed shaft:



Sketch of detail of shaft of Powell:



As shown in the above illustrations, the groove roots (from which the rib projects) of the shaft are substantially flat, in accordance with embodiments of the invention. In contrast, according to the Examiner's interpretation of POWELL, with which Applicant does not concede, the "rib" extends from two rounded channels. Applicant submits that POWELL fails to disclose or suggest that the at least one of groove heads and roots of the hub and shaft from which the at least one rib projects is substantially flat, as recited in claim 12. That is, there is no arguable disclosure of a rib extending from a substantially flat groove root or head; or the Examiner-designated groove G' is formed of two rounded channels and a "rib" extending from the



channels. Accordingly, there is again no express or implied disclosure of substantially flat groove roots from which the rib projects.

As shown in Figure 4 and 5 (and Applicant's enlarged depiction of POWELL), Examiner-designated groove G' has a concave shape recess on each side of the Examiner-designated rib. In other words, the rib of POWELL, at best, extends or projects from cross-sectional rounded recesses. While not at all discussed or mentioned in POWELL, these recesses are likely a consequence of the method of manufacturing the shaft 20. Moreover, as POWELL's recesses only exhibit a *rounded* shape, Applicant respectfully submits that these recesses cannot reasonably be construed as substantially flat. Moreover, as discussed further below (i.e., at page 19), Applicant respectfully submits that those of ordinary skill in the art would not construe the recesses of POWELL as defining the groove root, as the Examiner asserts.

Thus, for at least these reasons, Applicant respectfully submits POWELL does not teach or suggest at least the hub groove roots of the plurality of grooves of the hub are each substantially flat. Therefore, Applicant submits POWELL does not teach or suggest wherein the hub groove roots and the hub groove heads of the plurality of grooves of the hub and the shaft groove roots and the shaft groove heads of the plurality of grooves of the shaft are each substantially flat, as recited in claim 12, and does not render the present invention unpatentable.

No Teaching or Suggestion Of At Least One Of The Hub And The Shaft Is A Thin-Walled Hollow Profile Which Is Internally And Externally Splined

Additionally, Applicant submits POWELL does not teach or suggest at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined, as recited in claim 12. In accordance with aspects of the invention, the "thin-walled" hollow profile

results in light-weight hubs/shafts, which is very desirable, in particular, in the automotive industry. Moreover, the "thin-walled" hollow profile makes the hub/shaft sensitive to material inhomogeneities leading to increased manufacturing tolerances (though, still tolerances are very low), and more particularly, slight deviations in shape. This increased manufacturing tolerances is – at least to some extent – remedied by the provision of the rib, wherein the "thin-walled" hollow profile allows for some deformability of the hub/shaft so that the shape deviations can, at least in part, be compensated for. In addition, the claimed thin-walled hubs/shafts with the ribs have the advantage that they can be efficiently manufactured in high precision by means of cold forming as described in the description and in the withdrawn claims 27 – 29.

Referring again to Figures 4 and 5 of POWELL, Applicant submits, however, that neither of the Examiner-designated hub 68 or the Examiner-designated shaft 20 constitute a thin-walled hollow profile, which is internally and externally splined, as the Examiner asserts. A careful review of the Examiner-designated shaft 20 in Figure 4 reveals the shaft is not a hollow profile and is not internally and externally splined. Instead, the Examiner-designated shaft 20 is a solid shaft. Additionally, the Examiner-designated shaft 20 at least does not include internal splines. Additionally, Applicant respectfully submits the Examiner-designated hub 68 is at least not a thin-walled hollow profile.

Thus, for at least these reasons, Applicant respectfully submits POWELL does not teach or suggest at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined, as recited in claim 12. Therefore, Applicant submits POWELL does not teach or suggest each of the features of claim 12, and does not render the present invention unpatentable.

No Teaching Or Suggestion Of At Least One Rib Projecting Radially From One Of The Hub Groove Head, The Hub Groove Root, The Shaft Groove Head, And The Shaft Groove Root

Applicant submits that POWELL does not teach or suggest at least one rib projects radially from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root that is substantially flat. Applicant submits that those of ordinary skill in the art upon reviewing POWELL, would not construe the above-discussed hub groove root G' as substantially flat, but instead would readily understand hub groove root G' is formed with a *rounded* shape extending below the groove root.

That is, Applicant submits that one ordinarily skilled in the art would readily understand the upper surface of the Examiner-designated rib "R" forms the groove root. As such, Applicant submits the Examiner's interpretation of POWELL, POWELL fails to teach or suggest a rib projecting from the groove root. That is, the Examiner-designated rib "R" is not a rib projecting radially from the hub groove root, but instead the upper surface of the Examiner-designated rib "R" defines the groove root.

More specifically, looking closely at Figure 4, Applicant submits the groove root is located in the middle between two neighboring *splines 64*, and that the recesses left and right, respectively, thereof, are *below* the groove root level. That is, in POWELL, there are recesses formed at the transition from flank to groove root. The recesses are located close to the *splines 64* (cf. Figs. 4 and 5, *splines 64* of *shaft 20*). These recesses extend *below* the level of the groove root. In other words, the *recesses* do not form the *groove root*, but extend below the groove root. They neither have a well-defined shape nor a meaningfully definable level or depth. Thus, POWELL does not teach or suggest ribs, but instead discloses recesses (merely manufacturing-induced, acceptable structures).

Thus, in view of the above, Applicant submits the protruding portion (Examiner-labeled R) is not a rib, but the groove root, and the two recesses (or roundish structures) on either side of the groove root are structures which are unavoidably produced when manufacturing the Powell shaft. Applicant's position is supported by norms or standards, e.g., by DIN 5464 (portions of which, Applicant has reproduced below).

JK 621.824.44 September 1965

**Keilwellen-Verbindungen mit geraden Flanken**  
Schwere Reihe

**DIN 5464**

Straight-sided splines; heavy series

Maße in mm

Nicht angegebene Einzelheiten sind zweckentsprechend zu wählen.

A Keilnaben-Profil B Keilwellen-Profil

Die Flanken jedes Keiles müssen bis zum Schnittpunkt mit dem Innendurchmesser  $d_1$  parallel sein, wobei die Form des Keilgrundes freigestellt ist.

Bezeichnung eines Keilnaben-Profiles (A) von Nennmaßen 10x46x56 (1):  
Keilnaben-Profil A 10x46x56 DIN 5464

Bezeichnung eines Keilwellen-Profiles (B) von Nennmaßen 10x46x56 (1):  
Keilwellen-Profil B 10x46x56 DIN 5464

| Nennmaße  |  | Anzahl der Keile | Zentrierung 1)                            | $d_1$ | $d_2$ | $b$ | $d_3$ 2) | $g$ | $k$ | $r$  |
|---|--|------------------|---|-------|-------|-----|----------|-----|-----|------|
| Neues Kurzzeichen<br>Anzahl der Keile<br>x Innendurchmesser<br>x Außendurchmesser | Altes Kurzzeichen 3)<br>Innendurchmesser<br>x Außendurchmesser<br>x Keilbreite |                  |   |       |       |     |          |     |     |      |
| 10 x 16 x 20  | 16 x 20 x 2,5  | 10               | Innen-<br>oder<br>Flanken-<br>zentrierung | 16    | 20    | 2,5 | 14       | 0,3 | 0,3 | 0,15 |
| 10 x 18 x 22  | 18 x 22 x 3  |                  |   | 18    | 22    | 3   | 15,4     | 0,3 | 0,3 | 0,15 |
| 10 x 21 x 26  | 21 x 26 x 3  |                  |   | 21    | 26    | 3   | 18,4     | 0,3 | 0,3 | 0,15 |
| 10 x 22 x 28  | 22 x 28 x 4  |                  |   | 22    | 28    | 4   | 20,3     | 0,3 | 0,3 | 0,15 |
| 10 x 26 x 32  | 26 x 32 x 4  |                  |   | 26    | 32    | 4   | 22       | 0,4 | 0,4 | 0,15 |
| 10 x 28 x 35  | 28 x 35 x 4  |                  |   | 28    | 35    | 4   | 24,4     | 0,4 | 0,4 | 0,25 |
| 10 x 32 x 40  | 32 x 40 x 5  |                  |   | 32    | 40    | 5   | 28       | 0,4 | 0,4 | 0,25 |
| 10 x 36 x 45  | 36 x 45 x 5  |                  |   | 36    | 45    | 5   | 31,4     | 0,4 | 0,4 | 0,25 |
| 10 x 42 x 52  | 42 x 52 x 6  |                  |   | 42    | 52    | 6   | 34,9     | 0,5 | 0,5 | 0,4  |
| 10 x 46 x 56  | 46 x 56 x 7  |                  |   | 46    | 56    | 7   | 40,7     | 0,5 | 0,5 | 0,4  |
| 16 x 22 x 40  | 22 x 40 x 5  | 16               | Flanken-<br>zentrierung                   | 22    | 40    | 5   | 47       | 0,5 | 0,5 | 0,4  |
| 16 x 26 x 45  | 26 x 45 x 5  |                  |   | 26    | 45    | 5   | 50,6     | 0,5 | 0,5 | 0,4  |
| 16 x 32 x 55  | 32 x 55 x 6  |                  |   | 32    | 55    | 6   | 57,4     | 0,5 | 0,5 | 0,4  |
| 16 x 36 x 60  | 36 x 60 x 6  |                  |   | 36    | 60    | 6   | 60,3     | 0,5 | 0,5 | 0,4  |
| 16 x 42 x 72  | 42 x 72 x 8  |                  |   | 42    | 72    | 8   | 68,4     | 0,5 | 0,5 | 0,4  |
| 16 x 46 x 80  | 46 x 80 x 8  |                  |   | 46    | 80    | 8   | 74,4     | 0,5 | 0,5 | 0,4  |
| 20 x 32 x 62  | 32 x 62 x 7  |                  |   | 20    | 32    | 7   | 35,9     | 0,5 | 0,5 | 0,4  |
| 20 x 36 x 72  | 36 x 72 x 8  |                  |   | 36    | 72    | 8   | 40,7     | 0,5 | 0,5 | 0,4  |
| 20 x 42 x 82  | 42 x 82 x 8  |                  |   | 42    | 82    | 8   | 47,7     | 0,5 | 0,5 | 0,4  |
| 20 x 46 x 92  | 46 x 92 x 8  |                  |   | 46    | 92    | 8   | 52,6     | 0,5 | 0,5 | 0,4  |
| 20 x 52 x 102   | 52 x 102 x 8   | 20               | Flanken-<br>zentrierung                   | 52    | 102   | 8   | 60,3     | 0,5 | 0,5 | 0,4  |
| 20 x 56 x 112   | 56 x 112 x 8   |                  |   | 56    | 112   | 8   | 65,3     | 0,5 | 0,5 | 0,4  |
| 20 x 62 x 125   | 62 x 125 x 9   |                  |   | 62    | 125   | 9   | 72,7     | 0,5 | 0,5 | 0,4  |
| 20 x 66 x 140   | 66 x 140 x 9   |                  |   | 66    | 140   | 9   | 77,7     | 0,5 | 0,5 | 0,4  |

1) Innenzentrierung ist bei Herstellung der Keilwellen-Profile nach dem Wälzverfahren nicht bei sämtlichen Profilen möglich.

2) Diese Werte sind errechnet unter Zugrundelegung der Herstellung der Keilwellen-Profile nach dem Wälzverfahren.

3) Für besondere Fälle ist Außenzentrierung zugelassen.

4) Toleranzen für Innendurchmesser  $d_1$ , Außendurchmesser  $d_2$  und Keilbreite  $b$  nach DIN 5463 bei Bestellung vereinbaren.

5) Das alle in der Praxis nach verwendete Kurzzeichen soll bei Neukonstruktionen nicht mehr verwendet werden und ist nur noch in der Übergangszeit gültig.

Keilwellen-Verbindungen mit geraden Flanken, Oberseite, siehe DIN 5461

Keilwellen-Verbindungen mit geraden Flanken, Toleranzen, siehe DIN 5465

Anmerkung: Das neue Kurzzeichen ist entsprechend den Kurzzeichen für die leichte und mittlere Reihe in Anlehnung an internationale Vereinbarungen gebildet worden.

Arbeitsgemeinschaft Keilwellen-Verbindungen im Deutschen Normenausschuß (DNA)

The norm is entitled „Keilwellen-Verbindungen mit geraden Flanken“ (“Splined shaft connections with straight flanks”). The Figure on the right (“B Keilwellen-Profil”) shows approximately what is visible in Figure 5 of Powell. Referring to the table in DIN 5464, note that for magnitude  $d_1$  in the Figure, precise values are quoted ( $d_1$  defines the level of the groove root). For  $d_3$ , on the other hand, only a minimum value is quoted, i.e.  $d_3$  may assume as well

larger values than given in the table, in which case the recesses would be deeper (more pronounced). Furthermore, it is to be noted that in DIN 5464, the shape of the recesses is not defined. But this is no more than logical, since the recesses are structures that are simply given through the way of manufacturing of the splined shafts.

In view of the above, Applicant respectfully submits a person skilled in the art would identify Powell's recesses as a consequence of the method of manufacturing the shaft 20. This is probably the reason why these structures / recesses are not at all discussed or mentioned in Powell.

Moreover, referring again to the sketch detail of claimed shaft and the sketch detail of the Powell shaft (provided above), as is clear from, for example, claim 12 of the instant invention, the rib of the instant invention provides a protrusion, i.e., additional material added on the groove root. In contrast, as shown in the sketch detail of the Powell shaft, with Powell there are recesses on two sides of the groove root, suggesting material taken away from the groove root (and not added). This is a clear difference between the claimed invention and Powell.

As such, for at least these reasons, Applicant submits that POWELL does not teach or suggest at least one rib projects radially from one of the hub groove head, the hub groove root, the shaft groove head, and the shaft groove root, as recited in claim 12, and does not render the present invention unpatentable.

Accordingly, for at least the above reasons, Applicant respectfully submits POWELL does not teach or suggest each of the features of claim 12, and does not render the present invention unpatentable. Thus, Applicant requests the Examiner withdraw the rejection of claim 12, and indicate claim 12 is allowable.

Independent Claim 18

By the present amendment, Applicant has placed claim 18 into independent form, incorporating the features of previously presented claim 12. Claim 18 recites, in pertinent part:

... wherein at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined, and wherein a radius of a support surface of the at least one rib is such that the at least one rib imparts a connection between the hub and the shaft that is one of free from play and under initial stress with respect to a longitudinal axis of the hub or the shaft.

Applicant submits POWELL does not teach or suggest each of the features of claim 18. For example, Applicant submits POWELL at least does not teach or suggest: (1) wherein a radius of a support surface of the at least one rib imparts a connection between the hub grooves and the shaft grooves that is one of free from play and under initial stress with respect to a longitudinal axis of the hub or the shaft; and (2) wherein at least one of the hub and of the shaft is a thin-walled hollow profile which is internally and externally splined.

No Teaching or Suggestion Of A Connection Between The Hub And The Shaft That Is One Of Free From Play And Under Initial Stress

Applicant submits POWELL does not teach or suggest a radius of a support surface of the at least one rib is such that the at least one rib imparts a connection between the hub and the shaft that is one of free from play and under initial stress with respect to a longitudinal axis of the hub or the shaft, as recited in claim 18.

In accordance with aspects of the invention, the recited lack of play / pre-stress is useful in conjunction with the recited thin-walled hollow profiles. For example, this particular combination of features (the rib plus the thin walls plus the pre-stress/lack of play) has the advantage that – with respect to hub and/or shaft – deviations from a perfectly circular shape can

be compensated for. Such deviations (or ovalities) are – in case of thin-walled hollow profiles – quite common and hard to suppress; they mainly originate from inhomogeneities of the material of hub / shaft. In accordance with aspects of the invention, however, such deviations can be compensated for through deformation of the hollow profile (see, e.g., paragraph [0014] of the instant specification).

In addressing previously presented claim 18, the Examiner asserts:

Powell discloses (Fig. 8) that a radius of a support surface of the at least one rib (R) imparts a connection between the hub grooves (G) and the shaft grooves that is one of free from play and under initial stress with respect to a longitudinal axis of the hub (68) or the shaft (20).

Applicant respectfully disagrees. Applicant notes that the Examiner did not provide reference to any portion of POWELL as purportedly teaching or suggesting such features. Moreover, Applicant submits that POWELL does not teach or suggest wherein a radius of a support surface of the at least one rib imparts a connection between the hub grooves and the shaft grooves that is one of free from play and under initial stress with respect to a longitudinal axis of the hub or the shaft.

POWELL explicitly indicates that play exists between the output shaft 20 and the first speed gear 68 such that these components cannot be under an initial stress. That is, the express purpose of POWELL to utilize springs 150 and 152 to eliminate the existing play between the output shaft 20 and the first speed gear 68. For example, POWELL states at column 4, lines 36 – 45 that:

In view of the above it should be noted that during periods of either third or fourth speed gear operation, the low or first speed gear 68 is rotating freely on the splines 64 of output shaft 20 and not transmitting any power. Accordingly, during such periods, especially when the transmission is combined with an engine that is susceptible to the production of oscillatory frequencies, rattles may be produced by the free-running gear 68 and splined output shaft 20 as a consequence of induced vibratory or oscillatory frequencies.

In view of the above, Applicant respectfully submit that the Examiner-designated shaft 20 and the Examiner-designated hub 68 of POWELL is neither free from play nor under initial stress with respect to a longitudinal axis of the hub or the shaft. That is, in Powell, lots of play exists and possibly existing deviations from a proper shape of the profiles would be compensated by the "anti-rattle springs".

As such, Applicant respectfully submit POWELL does not teach or suggest wherein a radius of a support surface of the at least one rib imparts a connection between the hub grooves and the shaft grooves that is one of free from play and under initial stress with respect to a longitudinal axis of the hub or the shaft.

No Teaching or Suggestion Of At Least One The Hub And The Shaft Is A Thin-Walled Hollow Profile Which Is Internally And Externally Splined

As noted above, in accordance with aspects of the invention, the "thin-walled" hollow profile results in light-weight hubs/shafts, which is very desirable, in particular, in the automotive industry. Moreover, the "thin-walled" hollow profile makes the hub/shaft sensitive to material inhomogeneities leading to increased manufacturing tolerances (though, still tolerances are very low), and more particularly, slight deviations in shape. This increased manufacturing tolerances is – at least to some extent – remedied by the provision of the rib, wherein the "thin-



walled” hollow profile allows for some deformability of the hub/shaft so that the shape deviations can, at least in part, be compensated for.

For the reasons articulated above with respect to claim 12, Applicant submits POWELL does not teach or suggest at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined, as recited in claim 18. That is, Applicant submits, however, that neither of the Examiner-designated hub 68 or the Examiner-designated shaft 20 constitute a thin-walled hollow profile, which is internally and externally splined, as the Examiner asserts. A careful review of the Examiner-designated shaft 20 in Figure 4 reveals the shaft is not a hollow profile and is not internally and externally splined. Instead, the Examiner-designated shaft 20 is a solid shaft. Additionally, the Examiner-designated shaft 20 at least does not include internal splines. Additionally, Applicant respectfully submits the Examiner-designated hub 68 is at least not a thin-walled hollow profile.

Thus, for at least these reasons, Applicant respectfully submits POWELL does not teach or suggest at least one of the hub and the shaft is a thin-walled hollow profile which is internally and externally splined, as recited in claim 18. Therefore, Applicant submits POWELL does not teach or suggest each of the features of claim 18, and does not render the present invention unpatentable.

Accordingly, Applicant requests the Examiner withdraw the rejection of claim 18, and indicate claim 18 is allowable.

Dependent Claims 13 – 17, 19 – 21 and 30 over POWELL

Applicant respectfully submits that claims 13 – 17, 19 – 21 and 30 depend from allowable independent claim 12, and are allowable based upon the allowability of independent

claim 12, and because these claims recite additional subject matter to further define the instant invention.

Claim 19

Claim 19 recites, in pertinent part:

... wherein at least two parallel ribs radially extend from one of each hub groove head, each hub groove root, each shaft groove head and each shaft groove root.

In addressing claim 19, the Examiner acknowledges that POWELL fails to disclose the features of claim 19. However, the Examiner asserts:

It is well known in the art to provide the groove profile with more than that one rib extending radially from the hub groove head for more securing the hub and the shaft from disengaging due to external pressure. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the groove profile of the Powell [sic] with at least two ribs extend radially from the hub groove head, since it has been held that mere duplication of the essential working parts of the device involves only routine skill in the art.

Applicant respectfully disagrees with each of the Examiner's assertions. First, Applicant submits that the Examiner is merely asserting that providing more than one rib is well known in the art, without providing any support or foundation for such an assertion. To the extent that the Examiner is applying official notice, Applicant reminds the Examiner that MPEP 2144.03 specifically explains that "[o]fficial notice unsupported by documentary evidence should only be taken by the examiner where the facts asserted to be well-known, or to be common knowledge in the art are capable of instant and unquestionable demonstration as being well-known." Accordingly, Applicant respectfully requests that the Examiner produce documentary evidence to support the Examiner's apparent assertion of official notice.

Additionally, assuming *arguendo* that providing more than one rib is well known in the art, which Applicant does not concede, Applicant submits that it would not have been obvious to modify POWELL in such a manner as the Examiner asserts (i.e., for more securing the hub and the shaft from disengaging due to external pressure), as the Examiner-designated ribs of POWELL do not operate to secure the hub and the shaft from disengaging due to external pressure. That is, the shaft 20 and first gear 68 are not secured to one another, but rather a play exists between these two elements. As such, Applicant submits that it would not have been obvious to add an additional Examiner-designated rib to further secure the hub and the shaft from disengaging due to external pressure, as the Examiner asserts. As such, Applicant submits that the Examiner has not set forth a *prima facie* case of obviousness.

Furthermore, Applicant submits the Examiner did not address each of the features of claim 19. That is, the Examiner never addresses the recited parallel relationship between the recited more than one rib. As such, Applicant submits the Examiner has set forth an incomplete action and an unclear record.

Thus, for at least these reasons, Applicant submits the Examiner has not set forth a *prima facie* case of obviousness with regard to claim 19, and that POWELL does not teach or suggest each of the features of claim 19 and does not render the present invention unpatentable.

Accordingly, for at least these reasons, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of claims 13 – 17, 19 – 21 and 30 under 35 U.S.C. § 103(a) and indicate that claims 13 – 17, 19 – 21 and 30 are allowable.

2. Claims 22, 24 – 26 and 31 Over GROVES in view of POWELL

Applicant traverses the rejection of claims 22, 24 – 26 and 31 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 3,367,142 issued to Groves et al. [hereinafter GROVES] in view of POWELL. This rejection is respectfully traversed.

Independent Claim 22

Claim 22 recites, in pertinent part:

an outer tube having a plurality of grooves with an essentially quadrilateral groove cross section;

an inner tube having a plurality of grooves with an essentially quadrilateral groove cross section;

at least one rib radially projecting from one of the grooves of the outer tube or inner tube towards one of the grooves of the other of the outer tube or inner tube;

a radially inward surface of the groove of the outer tube forms an outer tube groove head and a radially outward surface of the groove of the outer tube forms an outer tube groove root; and

a radially inward surface of the groove of the inner tube forms an inner tube groove root and a radially outward surface of the groove of the inner tube forms an inner tube groove head,

wherein the at least one rib projects radially from one of the outer tube groove head, the outer tube groove root, the inner tube groove head, and the inner tube groove root,

wherein the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat, and

wherein at least one of the outer tube and the inner tube is a thin-walled hollow profile which is internally and externally splined.

Applicant submits that the combination of GROVES and POWELL does not teach or suggest each of the features of claim 22. For example, Applicant submits GROVES in view of POWELL does not teach or suggest: (1) an inner tube having a plurality of grooves with an essentially quadrilateral groove cross section; (2) the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the

inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat; and (3) at least one of the outer tube and the inner tube is a thin-walled hollow profile which is internally and externally splined. Moreover, Applicant submits that it would not have been obvious to modify GROVES in view of POWELL as the Examiner asserts.

#### No Teaching or Suggestion of an Inner Tube

In addressing claim 22, the Examiner asserts GROVES discloses an inner tube (11) having a plurality of grooves with an essentially quadrilateral groove cross section and refers to Figure 5. Applicant has reproduced Figure 5 of GROVES below.

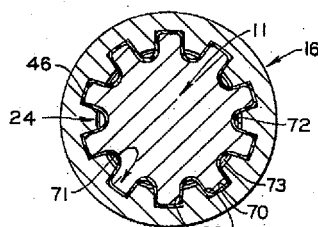


FIG. 5

As described in GROVES, element 11 is a shaft forged from a blank of steel (see, e.g., column 3, lines 64 – 70). Moreover, as shown in Figure 5, Applicant submits the shaft 11 is a solid shaft. Moreover, as would be understood by those of ordinary skill in the art upon reading the instant disclosure, a tube is a hollow structure (for example, as shown in Figure 1 of the present invention. As such, Applicant submits that GROVES does not disclose, teach or suggest an inner tube having a plurality of grooves with an essentially quadrilateral groove cross section.

Moreover, Applicant submits POWELL does not cure the deficiencies of GROVES. That is, POWELL does not disclose, teach or suggest an inner tube having a plurality of grooves

with an essentially quadrilateral groove cross section. Instead, referring to the above discussion of POWELL, Applicant submits POWELL also teaches a solid shaft 20.

Thus, Applicant submits that no proper combination of GROVES and POWELL teach or suggest an inner tube having a plurality of grooves with an essentially quadrilateral groove cross section, as recited in claim 22. Therefore, Applicant submits that GROVES in view of POWELL does not teach or suggest each of the features of claim 22, and does not render the present invention unpatentable.

No Teaching Or Suggestion Substantially Flat The Outer Tube Groove Roots,  
Outer Tube Groove Heads, Inner Tube Groove Roots And Inner Tube Groove  
Heads

Applicant submits that GROVES does not teach or suggest the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat. For example, as shown in Figure 5 of GROVES (reproduced above), Applicant submits at least Examiner-designated inner tube (i.e., solid shaft 11), which Applicant does not concede constitutes the recited inner tube, does not teach or suggest the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat. That is, at least the Examiner-designated inner tube groove roots are not substantially flat. As such, Applicant respectfully submits that GROVES does not teach or suggest the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat

Moreover, for the reasons articulated above with regard to claim 12, Applicant submits that POWELL does not cure the deficiencies of GROVES. That is, as noted above, Applicant submits POWELL does not teach or suggest wherein the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat.

Therefore, for at least these reasons, Applicant submits GROVES in view of POWELL does not teach or suggest the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove heads of the plurality of grooves of the inner tube are each substantially flat, as recited in claim 22, and does not render the present invention unpatentable.

No Teaching or Suggestion Of At Least One Of The Hub And Of The Shaft Is A Thin-Walled Hollow Profile Which Is Internally And Externally Splined

Applicants submits that GROVES in view of POWELL does not teach or suggest wherein at least one of the outer tube and the inner tube is a thin-walled hollow profile which is internally and externally splined, as recited in claim 22. For example, Applicant submits that neither the Examiner-designated inner tube (i.e., shaft 11) nor the Examiner designated outer tube (i.e., element 16) is a thin-walled hollow profile which is internally and externally splined, as recited in claim 22. That is, the Examiner-designated inner tube (i.e., shaft 11) is neither a thin-walled hollow profile nor both internally and externally splined. Instead, Applicant submits the Examiner-designated inner tube (i.e., shaft 11) is solid, and thus, not a thin-walled hollow profile. Moreover, Applicant submits that the Examiner-designated inner tube (i.e., shaft 11) is

not internally splined. With regard to the Examiner designated outer tube (i.e., element 16), Applicant submits that element 16 at least is not externally splined and is not thin-walled.

As such, GROVES – showing *thick-walled* hubs (sleeve 16) and *solid* shafts (spline shaft 11) only, in combination with POWELL, simply cannot render the invention obvious. Neither does the problem occur, nor could it be solved in the claimed way. Moreover, the above-described ovality problem solvable by the mentioned feature combination of the present invention does not (and practically cannot) occur in case of *solid* and *thick-walled* profiles (hub thick-walled, and shaft solid or thick-walled). That is, Applicant submits parts as voluminous as the walls of GROVES are not at all sensitive to inhomogeneities (e.g., ovalities) of the material. Moreover, even *if* the ovality problem *would* occur in case of solid / thick-walled profiles of GROVES, Applicant submits such a problem could not be solved in the way suggested by the present invention (e.g., with deformation), because a solid/thick-walled profile simply cannot be deformed at all or deformed to a sufficient extent in order to overcome an ovality problem.

Moreover, for the reasons articulated above with regard to claim 12, Applicant submits POWELL does not cure the above-noted deficiencies of GROVES. That is, a careful review of the Examiner-designated shaft 20 in Figure 4 of POWELL reveals the shaft is not a hollow profile and is not internally and externally splined. Instead, the Examiner-designated shaft 20 is a solid shaft. Additionally, the Examiner-designated shaft 20 at least does not include internal splines. Additionally, Applicant respectfully submits the Examiner-designated hub 68 is at least not a thin-walled hollow profile.

Therefore, for at least these reasons, Applicant submits GROVES in view of POWELL does not teach or suggest the outer tube groove roots and the outer tube groove heads of the plurality of grooves of the outer tube and the inner tube groove roots and the inner tube groove



heads of the plurality of grooves of the inner tube are each substantially flat, as recited in claim 22, and does not render the present invention unpatentable.

Not Obvious to Modify GROVES in view of POWELL as the Examiner Asserts

Additionally, Applicant submits that it would not have been obvious to modify GROVES in view of POWELL as the Examiner asserts. That is, in addressing claim 22, the Examiner acknowledges GROVES fails to disclose the recited rib. However, the Examiner asserts that POWELL discloses the recited rib. For the reasons articulated above, with regard to claim 12, Applicant respectfully submits POWELL does not disclose the recited rib.

Assuming *arguendo* that POWELL does disclose the recited rib, which Applicant does not concede, Applicant submits that one of ordinary skill in the art would not be motivated to modify GROVES with the Examiner-designated ribs of POWELL. That is, the Examiner asserts that it would have been obvious to provide GROVES with the at least one Examiner-designated rib of POWELL to prevent the outer and inner tubes from disengaging from one another.

However, as noted above, POWELL does not teach or suggest that the Examiner-designated ribs function in such a manner. Instead, POWELL explicitly discloses that a play will exist between the output shaft 20 and the first speed gear 68 (even though the Examiner-designated ribs are illustrated as present in the arrangement). As such, Applicant submits that one of skill in the art would not be motivated to modify GROVES to provide a feature that POWELL explicitly does not possess.

Thus, for at least these reasons, Applicant respectfully submits the Examiner has not set forth a *prima facie* case of obviousness. Therefore, Applicant submits that GROVES in view of

POWELL does not teach or suggest each of the features of claim 22, and does not render the present invention unpatentable.

Accordingly, for at least these reasons, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of claim 22 under 35 U.S.C. § 103(a) and indicate that claim 22 is allowable.

#### Dependent Claims 24 – 26 and 31

Applicant respectfully submits that claims 24 – 26 and 31 depend from allowable independent claim 22, and are allowable based upon the allowability of independent claim 22, and because these claims recite additional subject matter to further define the instant invention.

#### Claim 24

Additionally, Applicant submits GROVES in view of POWELL does not teach or suggest the features of claim 24. Claim 24 recites, in pertinent part:

... wherein the inner tube and the outer tube are hollow bodies each with an approximately uniform profile thickness.

In addressing claim 24, the Examiner designates the inner tube and the outer tube as elements 11 and 16 of GROVES respectively, and states that Figure 5 teaches the features of claim 24. Referring to Figure 5 of GROVES, reproduced above, Applicant submits that GROVES does not teach the inner tube and the outer tube are hollow bodies each with an approximately uniform profile thickness. Instead, as discussed above, Applicant submits the Examiner-designated inner tube is not a tube at all, but rather is a solid shaft. Moreover, as can be clearly observed in Figure 5, at least the Examiner-designated inner tube is not a hollow body

with an approximately uniform profile thickness, as, again, the Examiner-designated inner tube is a solid shaft.

Thus, Applicant submits GROVES in view of POWELL does not teach or suggest the features of claim 24, and does not render the present invention unpatentable.

#### Claim 26

Additionally, in addressing claim 26, the Examiner asserts that GROVES shows all the structural features of the instant invention, but for the essentially quadrilateral groove cross section is an essentially trapezoidal groove cross section. However, the Examiner asserts, that as the specification discloses that the groove cross section may be rectangular or trapezoidal, there is no criticality with respect to the shape of the shape of the rib and groove being claimed.

However, in addressing the recited trapezoidal shape of the groove cross section, the Examiner has not set forth a *prima facie* obviousness rejection. That is, the Examiner has not set forth a reason as to why one of skill in the art would be motivated to modify the cross sectional profile of the Examiner-designated groove of GROVES to a trapezoidal shape. As such, as discussed further below, Applicant submits that the Examiner has not set forth a clear record or a complete action.

Thus, for at least these reasons, Applicant submits GROVES does not teach or suggest each of the features of the present invention, and does not render the present invention unpatentable. Additionally, Applicant submits that the Examiner has not set forth a *prima facie* case of obviousness.

Accordingly, for at least these reasons, Applicant respectfully requests that the Examiner reconsider and withdraw the rejection of claims 24 – 26 and 31 under 35 U.S.C. § 103(a) and indicate that claims 24 – 26 and 31 are allowable.

### *New Claims*

By the present amendment, Applicant has presented new claims 32 – 35 for the Examiner's consideration. Applicant submits that claim 33 should be allowable for the reasons articulated with respect to claim 18. Additionally, Applicant respectfully submits that claims 32, 34 and 35 depend from respective allowable independent claims, and are allowable based upon the allowability of the independent claims as explained above, and because these claims recite additional subject matter to further define the instant invention. Additionally, Applicant submits that new claims 32, 34 and 35 recite features not disclose, taught or suggested by POWELL or GROVES.

For example, with regard to claim 32, which recites "substantially flat comprises lie along one of a plurality of circles concentric with the hub and the shaft," Applicant submits that neither POWELL nor GROVES disclose, teach or suggest this feature.

Accordingly, for at least these reasons, Applicant respectfully requests the Examiner indicate claims 32 – 35 as allowable.

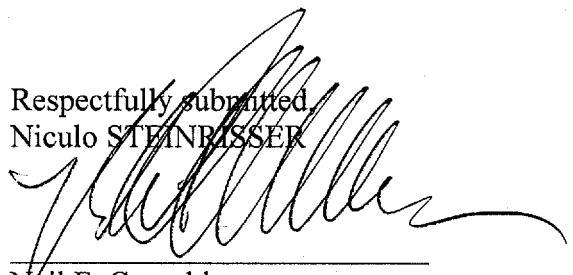
**CONCLUSION**

In view of the foregoing, it is submitted that none of the references of record, either taken alone or in any proper combination thereof, anticipate or render obvious the Applicant's invention, as recited in claims 12 – 22, 24 – 26 and 30 – 35. The applied references of record have been discussed and distinguished, while significant claimed features of the present invention have been pointed out.

Accordingly, reconsideration of the outstanding Office Action and allowance of the present application and all of the claims therein are respectfully requested and now believed to be appropriate.

Should there be any questions, the Examiner is invited to contact the undersigned at the below-listed telephone number.

Respectfully submitted,  
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